

WHAT IS CLAIMED IS:

1. An apparatus for monitoring the concentration of an oxidative gas or vapor, the apparatus comprising:

a first thermocouple junction;

5 a chemical substance coupled to the first thermocouple junction, the chemical substance reactive with the oxidative gas or vapor to produce heat; and

a second thermocouple junction coupled in series to the first thermocouple junction, whereby a net voltage is generated across the first and second thermocouple junctions upon exposure of the chemical substance to the oxidative gas or vapor, the net voltage corresponding to the concentration of the oxidative gas or vapor.

2. The apparatus as defined in Claim 1, wherein the second thermocouple junction is substantially similar to the first thermocouple junction.

3. The apparatus as defined in Claim 2, wherein the net voltage across the first and second thermocouple junctions is zero when the chemical substance is not exposed to the oxidative gas or vapor.

4. The apparatus as defined in Claim 1, wherein the oxidative gas or vapor comprises hydrogen peroxide.

5. The apparatus as defined in Claim 1, wherein the chemical substance is a material that chemically reacts with hydrogen peroxide.

6. The apparatus as defined in Claim 1, wherein the chemical substance is a material that catalytically decomposes hydrogen peroxide.

7. The apparatus as defined in Claim 1, wherein the chemical substance is a material that is oxidized by hydrogen peroxide.

8. The apparatus as defined in Claim 1, wherein the chemical substance comprises hydroxyl functional groups.

9. The apparatus as defined in Claim 1, wherein the apparatus further comprises a carrier which couples the chemical substance to the first thermocouple junction.

10. The apparatus as defined in Claim 1, wherein the apparatus further comprising a heat conductor between the chemical substance and the first thermocouple junction.

11. The apparatus as defined in Claim 1, wherein the apparatus further comprises a connector to connect and disconnect a first portion of the apparatus coupled to the chemical substance to a remaining portion of the apparatus.

12. The apparatus as defined in Claim 1, wherein the apparatus is positionable at one or more locations, whereby the net voltage is a function of the concentration of the oxidative gas or vapor at the location.

13. The apparatus as defined in Claim 1, wherein the second thermocouple junction is in a diffusion-restricted region with the first thermocouple junction.

14. The apparatus as defined in Claim 1, wherein the apparatus further comprises an integrated circuit chip which comprises the first thermocouple junction and second thermocouple junction.

15. The apparatus as defined in Claim 1, wherein the first thermocouple junction comprises a first conductor and a second conductor coupled to the first conductor, the second conductor being different from the first conductor, and the second thermocouple junction comprises the second conductor coupled to a third conductor.

16. The apparatus as defined in Claim 15, wherein the third conductor is composed of the same material as the first conductor.

17. The apparatus of Claim 15, wherein at least one of the first conductor, second conductor, and third conductor comprises a conductive film.

18. A method of monitoring the concentration of an oxidative gas or vapor, the method comprising:

providing a first thermocouple junction and a second thermocouple junction coupled together in series, the first thermocouple junction coupled to a chemical substance which undergoes an exothermic reaction with the oxidative gas or vapor to be monitored;

exposing the chemical substance to the oxidative gas or vapor, thereby generating a net voltage across the first and second thermocouple junctions,

whereby the net voltage is a function of the concentration of the oxidative gas or vapor;

measuring the net voltage across the first and second thermocouple junctions as an indication of the concentration of the oxidative gas or vapor.

5           19.    The method as defined in Claim 18, wherein the net voltage across the first and second thermocouple junctions is zero when the chemical substance is not exposed to the oxidative gas or vapor.

          20.    The method as defined in Claim 18, wherein the oxidative gas or vapor comprises hydrogen peroxide.

10           21.    The method as defined in Claim 18, wherein the chemical substance is a material that chemically reacts with hydrogen peroxide.

          22.    The method as defined in Claim 18, wherein the chemical substance is a material that catalytically decomposes hydrogen peroxide.

15           23.    The method as defined in Claim 18, wherein the chemical substance is a material that is oxidized by hydrogen peroxide.

          24.    The method as defined in Claim 18, wherein the chemical substance comprises hydroxyl functional groups.

          25.    The method as defined in Claim 18, wherein the chemical substance is coupled to the first thermocouple junction by a carrier.

20           26.    The method as defined in Claim 25, wherein the carrier comprises a gas-permeable pouch or gas-impermeable enclosure with at least one hole.

          27.    The method as defined in Claim 18, additionally comprising moving the apparatus to one or more locations, whereby the net voltage is a function of the concentration of the oxidative gas or vapor at the location.

25           28.    A sterilization system operated by a user, wherein the sterilization system comprises:

          a chamber;

          a door in the chamber;

          a source of oxidative gas or vapor in fluid connection with the chamber;

30           a chemical concentration measuring system comprising at least one apparatus according to Claim 1; and

a control system which receives input from the chemical concentration measuring system to produce a desired concentration of said oxidative gas or vapor.

- 5      29.      The system as defined in Claim 28, wherein the system further comprises a pumping system to reduce the pressure in the chamber.

TO CONTINUE